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(54) Surface wellheadand method of installing tubular casing

Übertagebohrlochkopfund Verfahren zum Einbauen eines Rohrstrangs

Tête de puits de surfaceet méthode pour installer un train de tiges tubulaires

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- **Prior use evidence (drawings, lists of parts and invoices) related to tubing tensioning in well equipment supplied by the opponent.**
- **Offshore Technology Conference paper no. OTC 4576.**
- **Composite Catalogue of Oil Field equipment and Services, 35th Revision 1982-83, published by "World Oil".**
- **Copy of page 171 from Practical Petroleum Engineer's Handbook.**
- **Mr. Michael J. Krenek's affidavit relating to the document OTC 4576.**
- **Copy of an extract from Cameron's Land and Platform Production catalogue of 1980-1981.**
- **Cameron Mudline Suspension manual of 1966; Section II; pages 1-24.**
- **FMC equipment running procedure manual which was copied from the Rig Book used by the operator Union Oil Company of Indonesia at the Attaka E-1 Well referred to in the document OTC 4576.**
- **Affidavit by Mr. T.G. Cassity provided by the opponent and dealing essentially with the matter of the obviousness to adapt the equipment of the second mentioned document, so that the tension is pulled and the gland nut adjusted, by a tool passing down through a blow out preventer.**

Remarks:

The file contains technical information submitted after the application was filed and not included in this specification

EP 0 251 595 B2

Description

This invention relates to a hanger assembly for use in a surface wellhead system.

In order to expedite cash flow and to minimise the period between development drilling and production flow, more and more companies operating in the oil and gas business are resorting to what is commonly referred to as 'Early Production Systems'.

These 'Early Production Systems' use a method of predrilling wells prior to the installation of jacket structures which allows an operator to mate a completed production jacket over pre-drilled wells which are subsequently tied back to the surface and can be brought into production within a short period of completing the topside of the production jacket.

The drilling components used to pre-drill wells have been developed to provide such features as needed for effective reconnection of casing strings which were disconnected prior to installation of the jacket. These systems, commonly referred to as 'mudline casing support equipment for jack up operations' and 'subsea wellhead equipment for floating rig operations' are organised in a fixed grid structure over which the production jacket is placed so that the tie-back strings, guided through fixed guides which are part of the platform structure, can enter connection receptacles which are part of the mudline support system or the subsea wellhead system. Once the casing strings are tied-back, they are terminated on the production deck of the platform with the use of conventional surface wellhead equipment.

It is essential that the tied-back casing strings should be under tension on installation, because heat generated by production fluids within the production tubing causes linear expansion of the casings which could otherwise cause them to buckle through induced compression. The casing strings therefore are tensioned at the surface wellhead and wedges are driven in between the casings and the high-pressure wellhead housing to maintain the tension. However, this known wedging system is imprecise in the amount of tension maintained as slippage can occur as the wedges are driven, and this becomes an acute problem on relatively short lengths of casing.

British Patent No. 1,171,201 discloses supporting a casing via co-operating surfaces on the casing hanger and the surface wellhead of an upper structure to prevent movement of the casing towards a lower structure. However, this system is also imprecise as there is no facility to vary the relative position of the co-operating surfaces which support the casing on the surface wellhead.

According to a first aspect of the present invention there is provided surface wellhead apparatus according to claim 1.

According to a second aspect of the present invention there is provided a method of installing tubular casing between a subsea structure (C) and a surface structure (G), according to claim 11.

Preferably the support surface comprises an upwardly-facing shoulder on the surface structure. the lock member having an abutment face which engages said shoulder to prevent movement of the casing towards the subsea structure. The lock member may be in the form of a ring, preferably having a greater diameter than the casing. The lock member may be in screw-threaded engagement with the casing, for example through a casing hanger from which the casing is suspended; the hanger may have a screw-threaded external face which engages with a correspondingly screw-threaded internal face of the annular lock member.

A seal is preferably provided above the lock member to prevent fluid flow between the fixture and the casing. The lock member may be disposed within a high-pressure housing, and the seal is advantageously formed by an annular sealing member which engages the lock member and is urged into engagement with the lock member by, for example, a tapered face of a bolt extending through a wall of the housing.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a schematic view of an offshore oil production platform having surface wellhead apparatus of the invention;

Fig. 2 is a side part-sectional view of surface wellhead apparatus of the present invention;

Fig. 3 is a view corresponding generally to the sectioned portion of Fig. 2 showing the manner of installation and setting of the apparatus; and

Fig. 4(a) and (b) are side sectional views showing the manner of setting apparatus of a further embodiment of the invention, with the high pressure housing removed for clarity.

Referring first to Fig. 1, a pre-drilled oil well A extends downwards through the sea bed from the mudline B at which a "centric 15" (Trade Mark) mudline suspension system C including a first fixing means formed by a casing hanger is located. After the well A has been drilled, it is sealed at the suspension system C until production is to be carried out. At that stage a production platform D is located above the oil well A, supported on legs E, and a tie-back string including concentric casing F is lowered from the platform D to the mudline suspension system C.

The lower end of the casing F is secured to the hanger at the suspension system C and tensioned upwardly from a surface wellhead system G on the platform D, as will now be described with reference to Figs. 2 and 3.

In Fig. 2, the surface wellhead comprises a high-pressure housing 2 which is permanently attached to a 13 5/8 inch casing 3 by a girth weld 5. An annulus formed between the 13 5/8 inch casing 3 and a 20 inch conduc-

tor casing 7 is shown as vented. but attachments may be provided to control this annulus if required. A tubing head adaptor spool 4 is bolted to the housing 2, and a block manifold 6 for connection to a downhole safety valve is bolted to the adaptor spool 4. Metal-to-metal seals 8 are provided on the wellhead to prevent leakage of fluid, with backup seals 10 spaced from the main seals 0 to allow the provision of monitoring ports 12 between them for checking for leakage.

A production tubing 14 extends into the wellhead and terminates in a hanger 16 which is suspended from a landing shoulder 18 on the housing 2. The hanger 16 is held on the shoulder 18 against upward movement by bolts 17 having a tapered end portion, the bolts 17 being spaced around the housing 2 and passing through the housing to engage in an inwardly-tapering annular recess 19 in the hanger 16.

An innermost casing 20 of 9 5/8 inches diameter concentric with the tubing 14 engages the fixed casing hanger at the mudline at its lower end and has a hanger 22 at its upper end having an internal screw thread 24 and an external screw thread 26. A second fixing means is formed by an internally-screw-threaded annular sleeve 28 or lock member and a landing shoulder 30 or support surface formed on the housing 2. The external thread 26 is engaged by the internally-screw-threaded annular sleeve 28 which rests on the landing shoulder 30. Thus the casing 20 is located on the housing 2 through the hanger 22 and sleeve 28.

An S-type annular metal-to-metal seal 32 is located above the sleeve 28 between the hanger 22 and housing 2, and a locating ring 34 retains the seal 32 and maintains the sleeve 28 tightly against the shoulder 30, being forced downwards by tapered radial bolts 36 which pass through the housing 2 and engage a correspondingly-inclined upper face of the ring 34. Thus rotation of the bolts 36 so that they travel radially inwardly through the housing 2 causes the ring 34 to be urged downwardly into tighter engagement with the sleeve 28.

Monitoring ports 38 extend from above and below the seal 32 for checking for fluid leakage.

Fig. 3 illustrates the manner of installation of the apparatus at the surface wellhead; blow-out preventers 40 replace the adaptor spool 4 during connection of the wellhead to a pre-drilled well at the sea bed.

Prior to installation of the production tubing 14 the casing strings are connected to a fixed point of the mudline casing hanger at the sea bed and passed into the wellhead for connection. A hanger running tool 42 which supports the casing during installation passes with the casing 20 down a central aperture through the blow-out preventers 40 and the housing 2 until the sleeve 28 spaces out above the shoulder 30. The running tool 42 has at its lower end a flange 46 which is externally screw-threaded to engage with the internal screw-thread 24 of the hanger 22. The tool 42 is pre-engaged with the hanger 22 by rotation.

An activator sleeve 48 disposed around the running tool 42 has a series of spaced pins 52 at its lower end which engage in corresponding recesses in the upper face of the sleeve 28 to lock the sleeves 48, 28 together for rotation. The activator sleeve 48 has a handle 54 at its upper end for use in rotating the sleeves.

An upward force is applied to the running tool 42 which has the effect of tensioning and stretching the casing 20, which raises the upper end of the casing and lifts the sleeve 28 upwards further away from the landing shoulder 30. When a desired tension has been applied and is being maintained by the tool 42 the activator sleeve 48 is rotated, causing the sleeve 28 also to rotate and move downwardly on its threaded connection 26 with the hanger 22 until it lands on the shoulder 30. The applied tension of the running tool 42 can then be released, the tension in the casing 20 being maintained by the engagement of the sleeve 28 on the shoulder 30. Precise control of the tension in the casing is thus obtained by manipulation through the well control equipment above the surface wellhead, while the option of shutting in the well at the surface is maintained if required by virtue of seals 49 between the activator sleeve 48 and the running stem of the running tool 42.

The activator sleeve 48 and running tool 42 are then removed, and the seal 32 and the locating ring 34 are installed (Fig. 2) to seal off the annulus 50. The radial bolts 36 are then inserted and tightened against the ring 34, compressing and activating the seal 32 and locking the sleeve 28 and the hanger 22 in position against the shoulder 28.

The assembly of this embodiment of the invention allows manipulation of the casing 20 to a precise predetermined tension and accurate spacing-out of the fixings at top and bottom of the casing 20 by means of the positive location of the hanger 22 on the housing 2 through the adjustable sleeve 28 landing on the shoulder 30. The installation procedure can be carried out while maintaining well control at all times, as it is performed through the well control equipment located above the surface wellhead whilst the option to shut in the well at the surface is retained during the tie-back operation.

Fig. 4(a) shows an alternative form of the apparatus, in the mode where the casing 20 has been run and latched into the mudline casing hanger, and tension is being applied to the casing 20 prior to location of the sleeve 28 on the shoulder 30. In this embodiment the running tool 42 has teeth 60 around its outer circumference which mate with teeth on an upper end of a ring 62 disposed around the running tool 42. The ring 62 comprises an annular body within which is held a cam 68 movable radially of the body and maintained in the outermost position by a cam surface 70 on the running tool 42. The ring 62 has further teeth 64 around an outer face at its lower end, and these mate with corresponding teeth on an inner face of the casing hanger 22. This arrangement ensures that there is a solid connection between the running tool 42 and the casing hanger 22 through the ring 62 for rotation of the casing 22 to latch

it into the mudline casing hanger, and avoids the less satisfactory screw-threaded connection of Fig. 3.

Fig. 4(b) shows the casing 20 maintained in tension by engagement of the sleeve 28 with the shoulder 30, this being achieved by rotation of the sleeve 28 on the screw thread of the casing hanger 22 to move it downwards into engagement with the shoulder 30 while pulling upwards on the running tool 42. The running tool 42 transfers the upward force to the casing 20 through the ring 62, cam 68 and hanger 22. Rotation of the sleeve 28 is by application of rotational force to the handle 54 of the activator sleeve 48 and transfer of that force to the sleeve 28 through the pin and recess connection 52 between the activator sleeve 48 and the sleeve 28.

Installation of the apparatus of Fig. 4 is as follows. A screw thread 65 on an external face of the running tool 42 is engaged with a screw thread 66 on an internal face of the body of the ring 62 so that the cam surface 70 is spaced below the cam 68 which collapses inwardly. The teeth 60 on the running tool are disengaged from and spaced below the teeth on the ring 62.

The running tool 42 and ring 62 are moved downwardly until the teeth 64 of the ring 62 abut the top of the casing hanger 22. The assembly is then rotated to allow the teeth 64 to mesh with the teeth in the top of the casing hanger 22, allowing the assembly to move further downwards over the hanger 22. The meshing teeth 64 hold the ring 62 and hanger 22 against relative rotation.

The running tool 42 is then rotated to unscrew the threads 65 and 66, causing the running tool 42 to move upwardly relative to the ring 62 as it disengages from it. This brings the surface 70 into engagement with the cam 68, forcing the cam 68 radially outwardly into engagement with a corresponding profile 74 on an inner face of the casing hanger 22 and thus locking the hanger 22 and ring 62 together against relative vertical movement.

On complete disengagement of the threads 65 and 66 the running tool 42 is pulled upwardly, causing the teeth 60 to engage with the corresponding teeth in the running tool 42 and moving the cam surface 70 into full engagement with the cam 68 as shown. This places the assembly in condition for latching the casing 20 into the mudline casing hanger as described above.

To remove the assembly after installation and tensioning of the casing 20, the above procedure is reversed to disconnect the assembly comprising the running tool 42, the ring 62 with the cam 68, and the activator sleeve 48 from the casing hanger 22 and sleeve 28. and the assembly is then withdrawn.

Claims

1. Surface wellhead apparatus comprising a surface structure (G); a blow-out preventer (40) mounted on the surface structure; a tubular casing (20) extending between a subsea structure (C) and the surface structure (G); first fixing means securing the casing (20) to the subsea structure (C); second fixing means (28, 30) securing the casing (20) to the surface structure (G), the second fixing means comprising a lock member (28) and a support surface (30), one of the lock member (28) or support surface (30) being disposed on the casing (20) and the other on the surface structure (G), the lock member (28) being releasably supported by the support surface (30) to prevent movement of the casing (20) towards the subsea structure (C); and an actuating tool (48) for axially moving the lock member (28); and characterised in that the lock member (28) is axially movable relative to the support surface in a direction longitudinal of the casing (20) independently of relative movement between the casing (20) and the surface structure (G), in that the actuating tool (48) is capable of passing through the blow-out preventer to engage and axially move the lock member; and in that a running tool (42) is provided for engaging the tubular casing at its upper end and applying tension thereto.

2. Surface wellhead apparatus as claimed in Claim 1, wherein the support surface (30) comprises an upwardly-facing shoulder (30) on the upper structure (G), the lock member (28) having an abutment face which engages the shoulder (30) to prevent movement of the casing (20) towards the subsea structure (C).

3. Surface wellhead apparatus as claimed in Claim 1 or Claim 2, wherein the lock member (28) is in the form of a ring (28) of greater diameter than the casing (20).

4. Surface wellhead apparatus as claimed in Claim 3, wherein the lock member (28) is in screw-threaded engagement with the casing (20).

5. Surface wellhead apparatus as claimed in Claim 4, wherein the lock member (28) is screw-threaded on an internal face and engages with a corresponding screw thread (26) on an external face of a casing hanger (22) from which the casing (20) is suspended.

6. Surface wellhead apparatus as claimed in Claim 4 or 5, whereby the actuating tool (48) and the lock member (28) are rotatable together.

7. Surface wellhead, apparatus as claimed in Claim 6, wherein the actuating tool (48) and lock member (28) are engageable by means of a projection-and-recess arrangement.

8. Surface wellhead apparatus as claimed in any one of Claims 3 to 7, wherein the lock member (28) en-

gages an annular sealing member (32) within an annular high-pressure housing, the sealing member (32) being urged into engagement with the lock member (28) by a tapered face of a bolt (36) which passes through the high-pressure housing.

9. Surface wellhead apparatus as claimed in any one of the preceding Claims, wherein the casing (20) depends from a casing hanger (22) which has a cam profile (74) adapted to receive a corresponding profile (68) of an engagement member (62) movable selectively to engage or disengage with the casing hanger (22), the engagement member (62) having means for engaging with a running tool (42) so that the running tool (42) is prevented from upward movement relative to the engagement member (62), and selectively-engageable means (70) are provided for transmitting rotational drive from the running tool (42) to the engagement member (62), said selectively-engageable means (70) being engageable by nonrotational movement of the running tool (42) relative to the engagement tool (62).

10. Surface wellhead apparatus as claimed in Claim 9, wherein further selectively-engageable means is provided between the running tool (42) and the engagement member (62), said further means being complementary screw threads (65, 66) on the running tool and on the engagement member (62).

11. A method of installing tubular casing between a subsea structure (C), located at the seabed (B), and a surface structure (G) with a blow-out preventer mounted thereon, the casing (20) having a main axis and having a lower portion which has a first fixing means for securing the casing (20) to the subsea structure (C), and an upper portion which has a second fixing means for securing the casing (20) to the surface structure (G), one of the second fixing means or the surface structure (G) comprising a lock member (28) and the other comprising a support surface (30), wherein the lock member (28) and the support surface (30) are relatively movable in a direction axially of the casing (20) independently of relative movement between the casing (20) and the surface structure (G), the method comprising inserting the casing (20) through the blow-out preventer and lowering the lower portion of the casing (20) to the subsea structure (C), engaging the first fixing means with the subsea structure (C), tensioning the casing (20) to a predetermined load, thereafter maintaining the casing (20) stationary with respect to the surface structure (G), moving the lock member (28) axially by means of an actuating tool inserted through the blow-out preventer (40) to bring the lock member (28) and the support surface (30) into contact with each other to lock the casing (20) between the subsea structure (C) and the surface structure (G), and to maintain the tension therein.

12. A method according to claim 11, wherein the lock member (28) is moved axially by rotation of the lock member (28).

13. A method according to claim 11 or claim 12, wherein the second fixing means comprises the lock member (28) and the surface structure (G) comprises the support surface (30).

14. A method according to any of claims 11 to 13, wherein the casing (20) is tensioned by means of a running tool (42) inserted throught the blow-out preventer (40).

Patentansprüche

1. Übertage-Bohrlochkopf-Vorrichtung mit einer Übertage-Anordnung (G); einem an der Übertage-Anordnung befestigten Ausblasverhinderer (40); einem Rohrstrang (20), der sich zwischen einer Untersee-Anordnung (C) und der Übertage-Anordnung (G) erstreckt, einer ersten Befestigungseinrichtung, welche den Rohrstrang (20) an der Untersee-Anordnung (C) befestigt; einer zweiten Befestigungseinrichtung (28, 30), welche den Rohrstrang (20) an der Übertagekonstruktion (G) befestigt, wobei die zweite Befestigungseinrichtung ein Verriegelungsteil (28) und eine Stützfläche (30) aufweist, von denen entweder das Verriegelungsteil (28) oder die Stützfläche (30) an dem Rohrstrang (20) und das andere Teil an der Übertageanordnung (G) angeordnet sind, wobei das Verriegelungsteil (28) mit der Stützfläche (30) lösbar verbunden ist, um eine Bewegung des Rohrstranges (20) in Richtung der Untersee-Anordnung (C) zu verhindern; und einem Betätigungswerkzeug (48) zur Axialbewegung des Verriegelungsteiles (28); **dadurch gekennzeichnet, daß** das Verriegelungsteil (28) relativ zu der Stützfläche (30) in einer Richtung längs des Rohrstranges (20) axial beweglich ist, unabhängig von einer Relativbewegung zwischen dem Rohrstrang (20) und der Übertage-Anordnung (G), daß das Betätigungswerkzeug (48) in der Lage ist, durch den Ausblasverhinderer für einen Eingriff und eine axiale Bewegung des Verriegelungsteiles zu passieren, und daß ein Laufwerkzeug (42) für einen Eingriff mit dem oberen Ende des Rohrstranges (20) und zur Spannungsbeaufschlagung desselben vorgesehen ist.

2. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 1, bei welcher die Stützfläche (30) eine nach oben weisende Schulter (30) an der oberen Anordnung (G) aufweist und das Verriegelungsteil (28) eine Anschlagfläche hat, die mit der Schulter

(30) zusammenwirkt, um eine Bewegung des Rohrstranges (20) gegen die Untersee-Anordnung (C) zu verhindern.

3. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 1 oder 2, bei welcher das Verriegelungsteil (28) die Ausbildung eines Ringes (28) mit einem Durchmesser größer als der Rohrstrang (20) hat.

4. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 3, bei welcher das Verriegelungsteil (28) einen Schraubgewinde-Eingriff mit dem Rohrstrang (20) hat.

5. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 4, bei welcher das Verriegelungsteil (28) einen Schraubgewinde-Eingriff an der Innenseite aufweist und mit einem korrespondierenden Schraubgewinde (26) an einer Außenseite eines Rohrstranggehänges (22) zusammenwirkt, von welchem der Rohrstrang (20) herabhängt.

6. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 4 oder 5, bei der das Betätigungswerkzeug (48) und das Verriegelungsteil (28) gemeinsam drehbar sind.

7. Vorrichtung mit einem Ubertage-Bohrlochkopf nach Anspruch 6, bei welcher das Betätigungswerkzeug (48) und das Verriegelungsteil (28) durch eine Anordnung mit einem Vorsprung und einer Aussparung gegenseitig zusammenwirken.

8. Vorrichtung mit einem Übertage-Bohrlochkopf nach einem der Ansprüche 3 bis 7, bei welcher das Verriegelungsteil (28) mit einem ringförmigen Dichtungsteil (32) innerhalb eines ringförmigen Hochdruckgehäuses zusammenwirkt, wobei das Dichtungsteil (32) in seinen Eingriff mit dem Verriegelungsteil (28) durch eine Konusfläche an einem Bolzen (36) gezwungen wird, der durch das Hochdruckgehäuse hindurchgeht.

9. Vorrichtung mit einem Ubertage-Bohrlochkopf nach einem der vorhergehenden Ansprüche, bei welcher der Rohrstrang (20) von einem Rohrstranggehänge (22) herabhängt, welches ein Nockenprofil (24) hat, das zur Aufnahme eines korrespondierenden Profils (68) eines Eingriffsteils (62) eingerichtet ist, welches wahlweise bewegbar ist, um mit dem Rohrstranggehänge (22) in Eingriff zu kommen oder sich davon zu lösen, wobei das Eingriffsteil (62) Mittel für einen Eingriff mit einem Laufwerkzeug (42) aufweist, so daß das Laufwerkzeug (42) an einer Aufwärtsbewegung relativ zu dem Eingriffsteil (62) gehindert wird, und wobei wahlweise in Eingriff bringbare Mittel (70) vorgesehen sind, um einen Drehantrieb von dem Laufwerkzeug (42) an das Eingriffsteil (62) zu übertragen, wobei die wahlweise in Eingriff bringbaren Mittel (70) durch eine nichtdrehende Bewegung des Laufwerkzeuges (42) relativ zu dem Eingriffsteil (62) in Eingriff bringbar sind.

10. Vorrichtung mit einem Übertage-Bohrlochkopf nach Anspruch 9, bei welcher weitere wahlweise in Eingriff bringbare Mittel zwischen dem Laufwerkzeug 842) und dem Eingriffsteil (62) vorgesehen sind, wobei diese weiteren Mittel komplementäre Schraubgewinde (65,66) an dem Laufwerkzeug und an dem Eingriffsteil (62) sind.

11. Verfahren zur Installation eines Rohrstranges zwischen einer Untersee-Anordnung (C), die am Meeresboden (B) angeordnet ist und einer Übertage-Anordnung (G) mit einem daran befestigten Ausblasverhinderer, wobei der Rohrstrang (20) eine Hauptachse hat und einen unteren Abschnitt aufweist, der eine erste Befestigungseinrichtung zum Befestigen des Rohrstranges (20) an der Untersee-Anordnung (C) hat, und einen oberen Abschnitt, der eine zweite Befestigungseinrichtung zum Befestigen des Rohrstranges (20) an der Übertage-Anordnung (G) hat, wobei entweder die zweite Befestigungseinrichtung oder die Übertage-Anordnung (G) ein Verriegelungsteil (28) und das andere Teil eine Stützfläche (30) aufweist, wobei das Verriegelungsteil (28) und die Stützfläche (30) relativ zueinander in einer axialen Richtung des Rohrstranges (20) beweglich sind, unabhängig von einer Relativbewegung zwischen dem Rohrstrang (20) und der Übertage-Anordnung (G), wobei das Verfahren das Einsetzen des Rohrstranges (20) durch den Ausblas-Verhinderer hindurch umfaßt und das Absenken des unteren Bereiches des Rohrstranges (20) auf die Untersee-Anordnung (C), den Eingriff der ersten Verriegelungseinrichtung mit der Unterseestruktur (C), Spannen des Rohrstranges (20) auf eine vorbestimmte Last, daraufhin das Unbeweglichhalten des Rohrstranges (20) bezüglich der Übertage-Vorrichtung (G), axiales Bewegen des Verriegelungsteiles (28) mittels eines Bewegungswerkzeuges, welches durch den Ausblasverhinderer (40) eingesetzt wird, um das Verriegelungsteil (28) und die Stützfläche (30) in Kontakt miteinander zu bringen, um den Rohrstrang (20) zwischen der Untersee-Anordnung (C) und der übertage-Anordnung (G) zu verriegeln und die Spannung darin aufrechtzuerhalten.

12. Verfahren nach Anspruch 11, wobei das Verriegelungsteil (28) durch die Rotation des Verriegelungsteiles (28) axial bewegt wird.

13. Verfahren nach Anspruch 12 oder 13, wobei die zweite Befestigungseinrichtung ein Verriegelungsteil (28) umfaßt und die Übertage-Anordnung (G)

die Stützfläche (30) umfaßt.

14. Verfahren nach einerm der Ansprüche 11 bis 13, wobei der Rohrstrang (20) durch ein Laufwerkzeug (42) gespannt wird, welches durch den Ausblasverhinderer (40) eingeführt wird.

Revendications

1. Appareil de têtes de puits de surface comprenant une structure de surface (G), un dispositif anti-éruption (40) monté sur la structure de surface, un train de tiges tubulaires (20) situé entre une structure sous-marine (C) et la structure de surface (G), un premier dispositif de fixation du train de tiges sur la structure sous-marine (C), un second dispositif de fixation (28, 30) du train de tiges sur la structure de surface (G), le second dispositif de fixation comprenant un élément de verrouillage (28) et une surface de support (30), l'élément de verrouillage (28) ou la surface de support (30) étant disposé(e) sur le train de tiges (20), tandis que l'autre est agencé(e) sur la structure de surface (G), l'élément de verrouillage (28) étant supporté de manière débrayable par la surface de support (30) afin d'empêcher tout mouvement du train de tiges (20) en direction de la structure sous-marine (C), et un outil d'actionnement (48) pour déplacer axiallement l'élément de verrouillage (28), caractérisé en ce que l'élément de verrouillage (28) est déplaçable axialement par rapport à la surface de support selon la direction longitudinale du train de tiges (20) indépendamment de tout mouvement relatif entre le train de tige (20) et la structure de surface (G), en ce que l'outil d'actionnement (48) est susceptible de passer à travers le dispositif anti-éruption (40) pour se mettre en prise et déplacer axiallement l'élément de verrouillage, et en ce qu'il comprend en outre un outil mobile (42) destiné à venir se mettre en prise sur le train de tiges tubulaire (20) au niveau de son extrémité supérieure et pour y exercer une tension.

2. Appareil de tête de puits de surface selon la revendication 1, caractérisé en ce que la surface de support (30) comprend un épaulement (30) orienté vers le haut sur la structure supérieure (G), le membre de verrouillage (28) présentant une surface de butée qui bloque l'épaulement (30) afin d'empêcher tout mouvement du train de tiges (20) vers la structure sous-marine (C).

3. Appareil de tête de puits de surface selon la revendication 1 ou 2, caractérisé en ce que l'élément de verrouillage (28) a la forme d'un anneau (28) dont le diamètre est supérieur à celui du train de tiges (20).

4. Appareil de tête de puits de surface selon la revendication 3, caractérisé en ce que l'élément de verrouillage (28) est vissé au train de tiges (20).

5. Appareil de tête de puits de surface selon la revendication 4, caractérisé en ce que le membre de verrouillage (28) est taraudé sur sa face interne et vient s'engager sur un filetage de vis correspondant (26) situé sur la face externe d'une suspension de train de tiges (22) à laquelle est suspendu le train de tiges (20).

6. Appareil de tête de puits de surface selon la revendication 4 ou 5, caractérisé en ce que l'outil d'actionnement (48) et l'élément de verrouillage (28) peuvent tourner ensemble.

7. Appareil de tête de puits de surface selon la revendication 6, caractérisé en ce que l'outil d'actionnement (48) et l'élément de verrouillage (28) peuvent être joints par un assemblage mâle/femelle.

8. Appareil de tête de surface selon l'une des revendications 3 à 7, caractérisé en ce que l'élément de verrouillage (28) s'accouple avec un élément d'étanchéité annulaire (32) à l'intérieur d'un carter annulaire haute pression, l'élément d'étanchéité (32) étant forcé de s'accoupler avec l'élément de verrouillage (28) sous la pression d'une face conique d'un boulon (36) qui traverse le carter haute pression.

9. Appareil de tête de puits de surface selon l'une des revendications précédentes, caractérisé en ce que le train de tiges (20) est suspendu à une suspension de train de tiges (22) qui présente un profil de came (74) adapté pour recevoir un profil correspondant (68) d'un membre d'engagement (62) qui peut se déplacer sélectivement pour s'engager avec ou se dégager de la suspension de train de tiges (22), le membre d'engagement (62) étant doté de dispositifs d'engagement avec un outil mobile (42) de manière à empêcher que l'outil mobile ne se déplace vers le haut par rapport au membre d'engagement (62) ; des dispositifs à engagement sélectif (70) sont prévus pour transmettre l'entraînement rotatif de l'outil mobile (42) au membre d'engagement (62), ledit dispositif à engagement sélectif (70) ne pouvant être engagé que lorsque l'outil mobile (42) ne tourne pas par rapport à l'outil d'engagement (62).

10. Appareil de tête de puits de surface selon la revendication 9, caractérisé en ce qu'un autre dispositif à engagement sélectif est prévu entre l'outil mobile (42) et le membre d'engagement (62), ledit autre moyen consistant en des filetages de vis complémentaires (65, 66) au niveau de l'outil mobile et du

membre d'engagement (62).

11. Méthode pour installer un train de tiges tubulaires entre une structure sous-marine (C) localisée au fond de la mer (B), et une structure de surface (G), munie d'un dispositif anti-éruption, le train de tiges (20) présentant un axe principal et étant doté d'une partie inférieure munie d'un premier dispositif de fixation dudit train de tiges (20) sur la structure sous-marine (C), et d'une partie supérieure dotée de seconds moyens de fixation dudit train de tige (20) sur la structure de surface (G), l'un desdits seconds moyens de fixation ou la structure de surface (G) comprenant un élément de verrouillage (28) tandis que l'autre comprend une surface de support (30), caractérisée en ce que l'élément de verrouillage (28) et la surface de support (30) peuvent se déplacer l'un par rapport à l'autre parallèlement à l'axe du train de tiges (20) indépendamment du mouvement relatif entre le train de tiges (20) et la structure de surface (G), la méthode consistant à insérer le train de tiges (20) à travers le dispositif anti-éruption et à abaisser la partie inférieure du train de tiges (20) vers la structure sous marine (C), à engager le premier dispositif de fixation avec la structure sous-marine (C), à soumettre le train de tiges (20) à une tension déterminée, puis à maintenir le train de tiges (20) en état stationnaire par rapport à la structure de surface (G), à déplacer axiallement l'élément de verrouillage (28) au moyen d'un outil d'actionnement inséré à travers le dispositif anti-éruption (40) afin d'acheminer l'élément de verrouillage (28) et la surface de support (30) en contact l'un de l'autre pour verrouiller le train de tiges (20) entre la structure sous-marine et la structure de surface (G) et pour maintenir l'ensemble sous tension.

12. Méthode selon la revendication 11, caractérisée en ce que l'élément de verrouillage (28) est déplacé axiallement par rotation de l'élément de verrouillage (28).

13. Méthode selon l'une des revendications 11 ou 12, caractérisée en ce que le second moyen de fixation comprend l'élément de verrouillage (28) et en ce que la structure de surface (G) comprend la surface de support (30).

14. Méthode selon l'une des revendications 11 à 13, caractérisée en ce que le train de tiges (20) est mis sous tension au moyen d'un outil mobile (42) inséré à travers le dispositif anti-éruption (40).

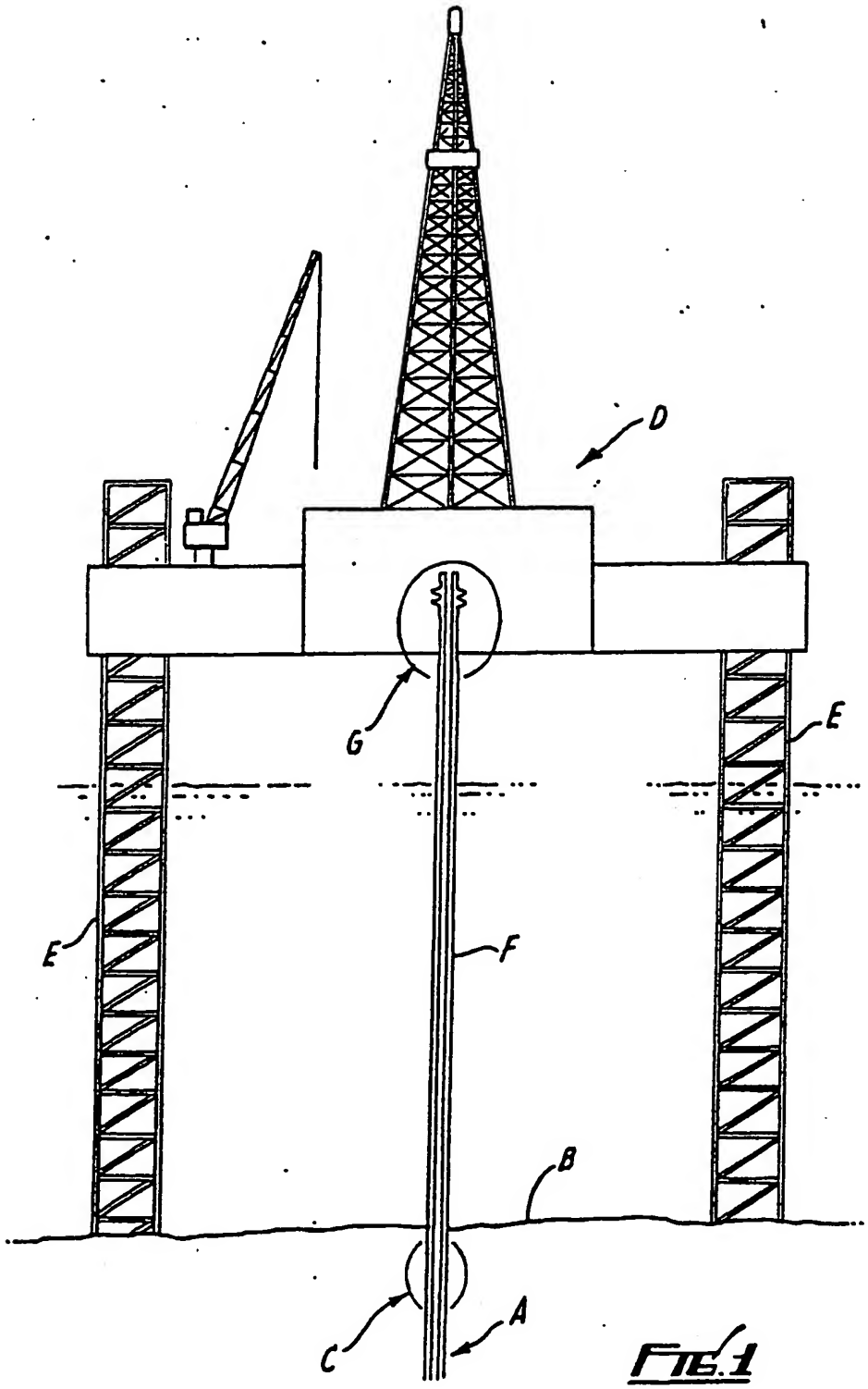

FIG.1

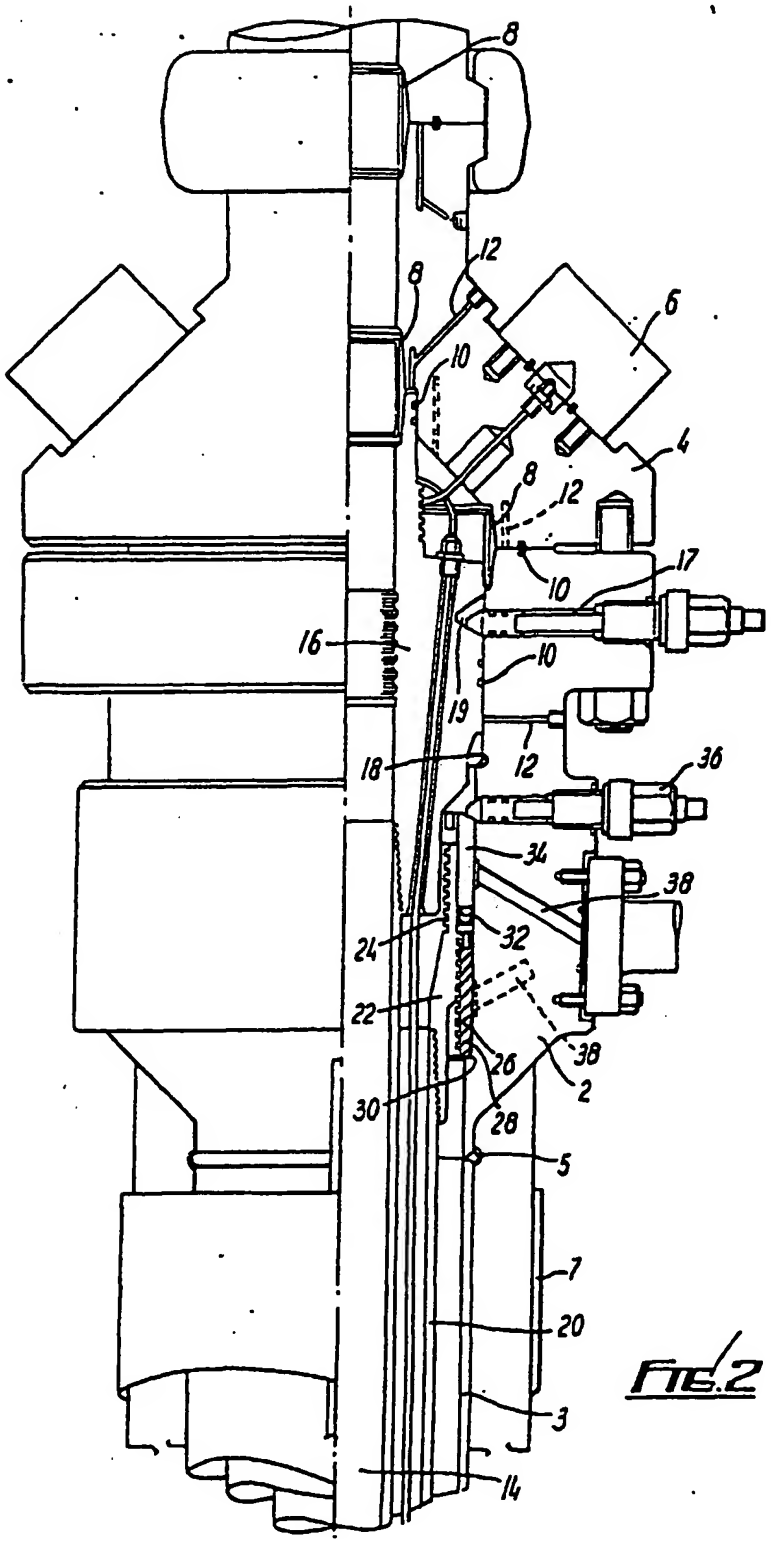
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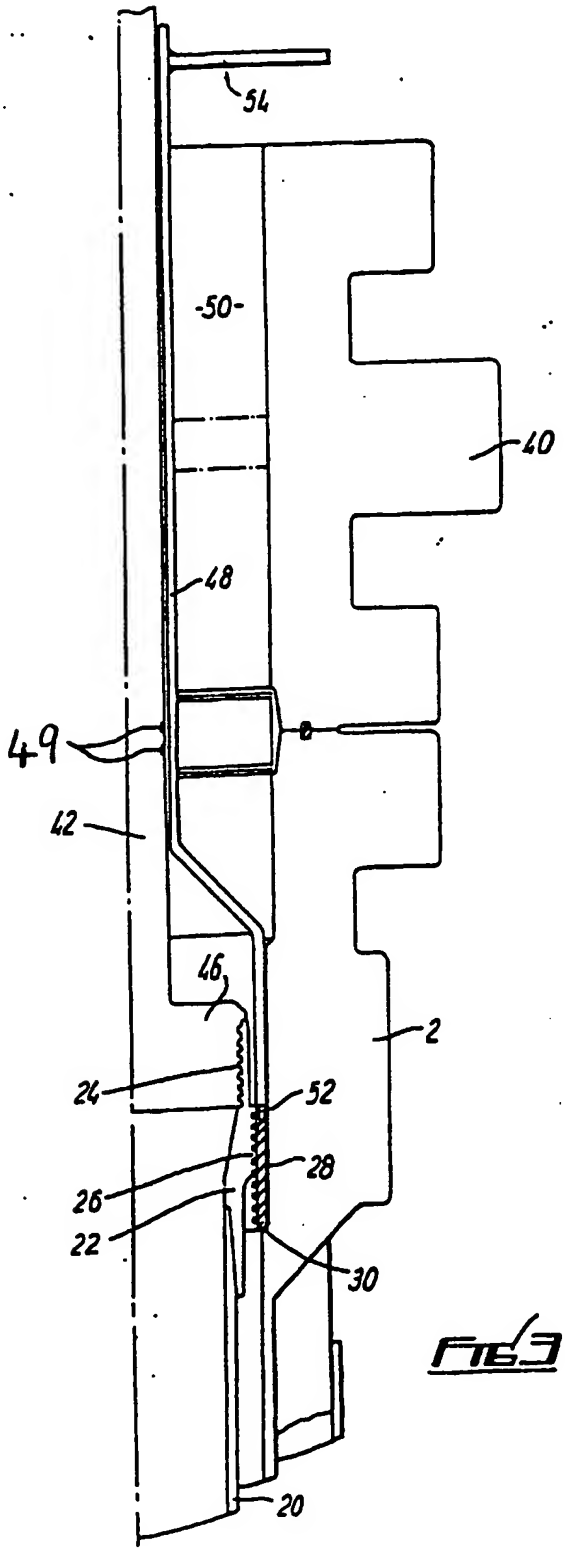
FIG.2



Фиг3

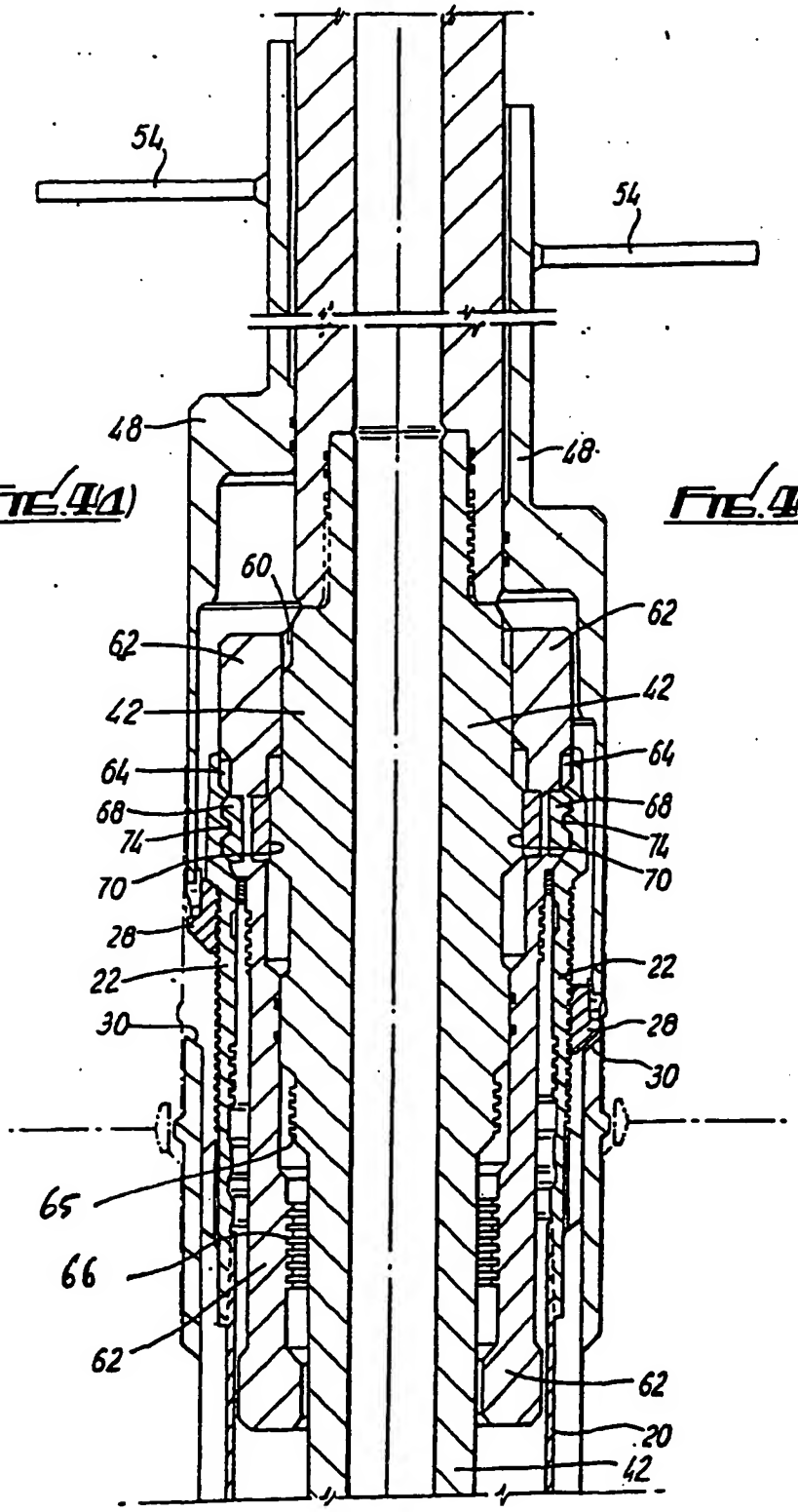

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FIG.4a)

FIG.4b)